MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

BMF1014 – MATHEMATICS FOR FINANCE

(All Sections / Groups)

16 OCTOBER 2015
3.00 p.m. - 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages, exclusive of a list of formulae.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

Question 1 [Total = 25 marks]

a) The following are revenue and cost functions x:

$R(x) = x(2500 - 60x)$
$C(x) = 4000 + 500x$

where x is in thousands of computers, and $R(x)$ and $C(x)$ are in thousands of dollars. Both functions have domain $1 \leq x \leq 40$.

i. Sketch a graph of both functions in the same coordinate system. [4 marks]
ii. Find the break-even points. [5 marks]
iii. For what outputs will a loss occur? Will a profit occur? [4 marks]

b) Solve the following system of equations using Gauss-Jordan elimination method:

$$2x_1 - 2x_2 + x_3 = 3$$
$$3x_1 + x_2 - x_3 = 7$$
$$x_1 - 3x_2 + 2x_3 = 0$$

[12 marks]

Question 2 [Total =25 marks]

a) Find a, b, c and d so that $\begin{bmatrix} 1 & -2 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$

[8 marks]

b) How long does it take for a \$2,400 investment at 13% compounded quarterly to be worth more than a \$3,000 investment at 6% compounded quarterly?

[7 marks]

c) A vehicle costs \$80,000. Kate pays 10% down and amortizes the rest with equal monthly payment over a 7 year period. If Kate must pay 9.25% compounded monthly:

i. What is her monthly payment? [7 marks]
ii. How much interest will she pay? [3 marks]

Continued.....

Question 3 [Total =25 marks]

a) Compute the derivative of

i. $f(x)=\dfrac{x^2+3x-2}{\sqrt{x}}$ [3 marks]

ii. $f(x)=(x^3+x-1)^3$ at $x=-2$ [4 marks]

b) During the Christmas season, a company purchases cheap red felt stockings, glue fake white fur and sequins onto them, and packages them for distribution. The total cost of producing q cases of stockings is given by

$$c=3q^2+50q-18q\ln q+120$$

i. Find the average cost. [3 marks]
ii. Find the number of cases that should be processed in order to minimize the average cost per case. Show that it is a minimum. [7 marks]
iii. Determine (to two decimal places) this minimum average cost. [2 marks]

c) For the function given, find the intervals on which the function is increasing and decreasing.

$$f(x)=2x^2-16x+33$$

[6 marks]

Question 4 [Total =25 marks]

a) Evaluate the following:

i. $\int x^3\sqrt{x^4+5}dx$ [4 marks]

ii. $\int x^2e^{-x}dx$ [7 marks]

b) A company produces two types of toy cars per day, x units of type A and y units of type B. If the revenue and cost equations for the day (in thousands of dollar) are given by

$$R(x,y)=20x+25y$$
$$C(x,y)=2x^2-5xy+4y^2-5x+9y+7$$

i. Determine how many of each type of toy car should be produces per day to maximize profit?
ii. Show that the profit is maximum.
iii. What is the maximum profit?

[14 marks]

End of paper

LIST OF FORMULAE

1. Quadratic Formula [$ax^2+bx+c=0,\ a\neq 0$]

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

2. Simple Interest
   (i) Interest: $I=Prt$ (P = principal, r = interest rate, t = number of years)
   (ii) Accumulated amount, $A=P(1+rt)$

3. Compound Interest
   (i) Accumulated amount, $A=P(1+i)^n$ where $i=\frac{r}{m}$ and $n=mt$
   (ii) Present value for compound interest, $P=A(1+i)^{-n}$

4. Effective Rate of Interest, $r_{eff}=\left(1+\frac{r}{m}\right)^m-1$

5. Future Value of an Annuity, $S=R\left[\frac{(1+i)^n-1}{i}\right]$

6. Present Value of an Annuity, $P=R\left[\frac{1-(1+i)^{-n}}{i}\right]$

7. Amortization Formula, $R=\frac{Pi}{1-(1+i)^{-n}}$

8. Sinking Fund Formula, $R=\frac{Si}{(1+i)^n-1}$

9. Basic Rules of Differentiation

a) Derivative of a constant: $\frac{d}{dx}(c)=0$

b) Power rule: $\frac{d}{dx}\left(x^n\right)=nx^{n-1}$

c) Sum rule: $\frac{d}{dx}[f(x)\pm g(x)]=\frac{d}{dx}[f(x)]\pm\frac{d}{dx}[g(x)]$

a) Product rule: $\frac{d}{dx}[f(x)g(x)]=f(x)g'(x)+g(x)f'(x)$

b) Quotient rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]=\frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$

c) Chain rule: $\frac{dy}{dx}=\frac{dy}{du}\bullet\frac{du}{dx}$

d) General Power rule: $\frac{d}{dx}\left[u^n\right]=nu^{n-1}\frac{d}{dx}u$

e) Logarithmic function: $\frac{d}{dx}(\ln u)=\frac{1}{u}\left(\frac{du}{dx}\right)$

f) Exponential function: $\frac{d}{dx}\left(e^u\right)=e^u\frac{du}{dx}$

10. Basic Rules of Integration

a) Indefinite integral of a constant: $\int k\,du = ku + C$

b) Power rule: $\int u^n\,du = \frac{u^{n+1}}{n+1}+C$

c) Sum rule: $\int [f(u) \pm g(u)]\,du = \int f(u)\,du \pm \int g(u)\,du$

d) Logarithmic function: $\int \frac{1}{u}\,du = \ln u + C$

e) Exponential function: $\int e^u\,du = e^u + C$

f) Integration by Parts : $\int U\,dv = UV - \int V\,du$